The Web Browser Personalization with the Client Side Triplestore

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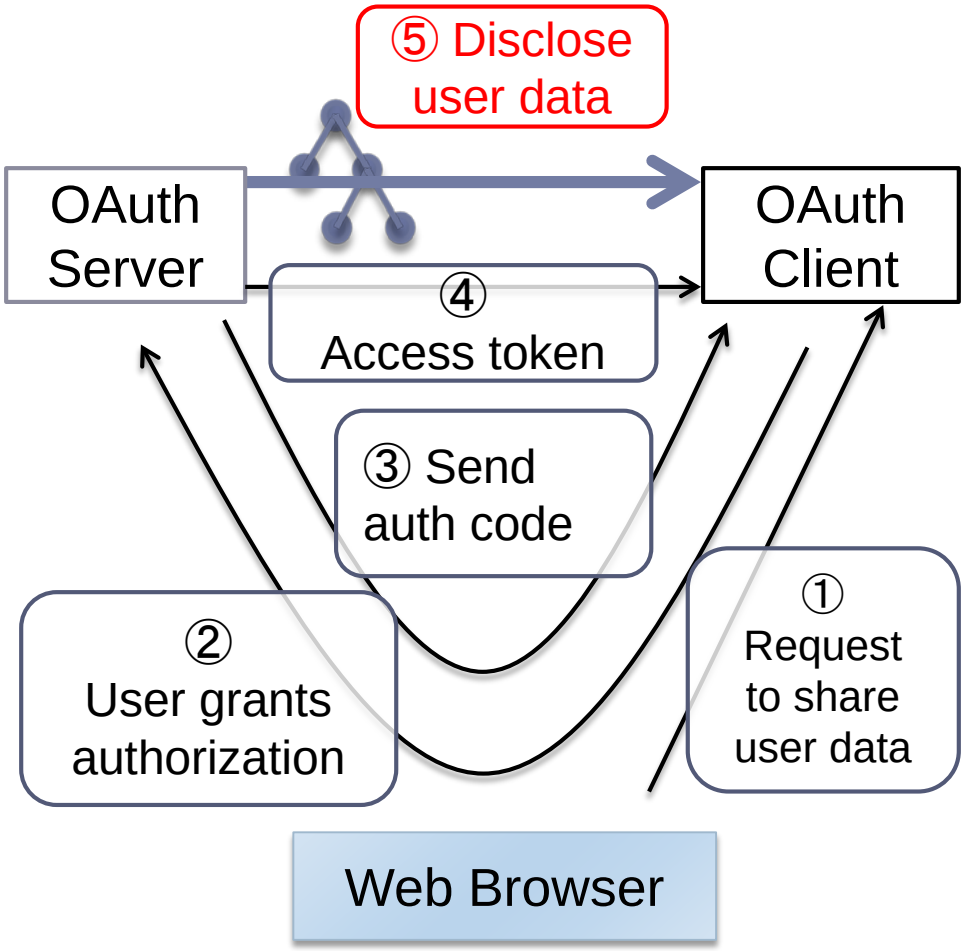
Issue #1 : Silos of Current Web Services

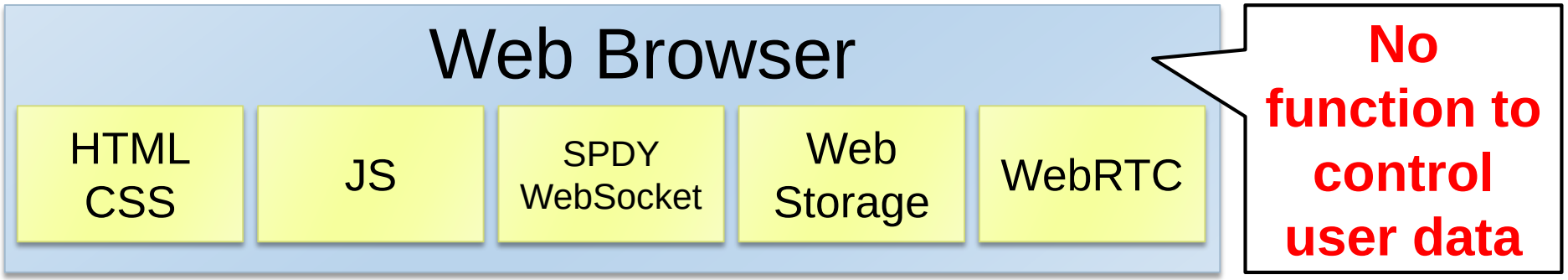
- Productive web services
  - All done with web browsers
  - Document, Presentation, Schedule, Email, Photo, SNS
- However, not enough options to mash up and utilize user data among services
  - Standard way only with OAuth
    - Can't mash up with services which don't support OAuth
    - Don't pay attention to which user data are still opened
    - Difficult for general users to understand what happens during redirections



A flow of OAuth protocol

Issue #2 : User Data Centralization on 3rd Parties

- Functional web browsers with innovative technologies
  - Rendering rich graphical web pages with CSS
  - Real-time transfer protocol with SPDY, WebSocket
  - Video streaming interface with WebRTC
  - Client data storage with Web Storage, IndexedDB
- However, we strongly depend on the qualities of 3rd party services to control our personal data on the web
  - **No** ability to control on web browsers. Just web application execution engine
  - **Only after** disclosing our private data, we can utilize on the web



What We Want to Achieve

- Mash up user data without disclosing our private data and personalize browsing experiences with semantic web
  - **TriplestoreJS** library on HTML5 Web Storage
    - Collect personal semantic data into web browsers during browsing
  - Web browser personalization plugin **Semantic Spider**
    - Enhance user experiences on web browsers with utilizing collected personal semantic data

OSS

- Provide new inspirations for HTML5 developers to integrate semantic web

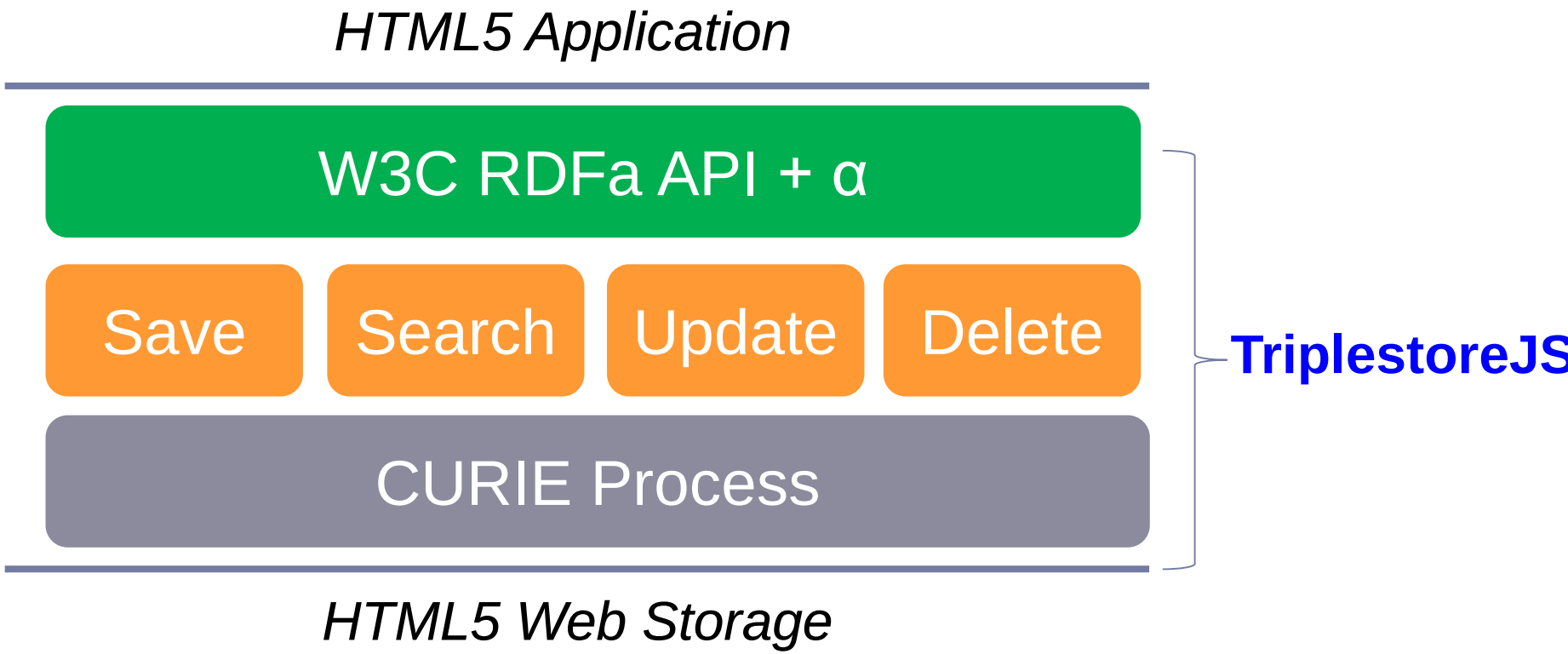
Related Works

- Knowledge bases on server sides
  - DBpedia making tons of knowledge of Wikipedia accessible
  - Search engines not only identifying embedded data for web search but also extracting semantic data
- Knowledge bases on client sides
  - Web browser plugins : Tabulator, Piggy Bank
    - Easy UI to view/edit collected personal semantic data
    - Can update semantic data with sending SPARQL update
  - However, development tools for experts of SemWeb
    - General users don't directly get benefits during browsing
    - Difficult for HTML5 developers not familiar with SemWeb stuffs

We show new potentials for web browsers to
provide new user experiences by

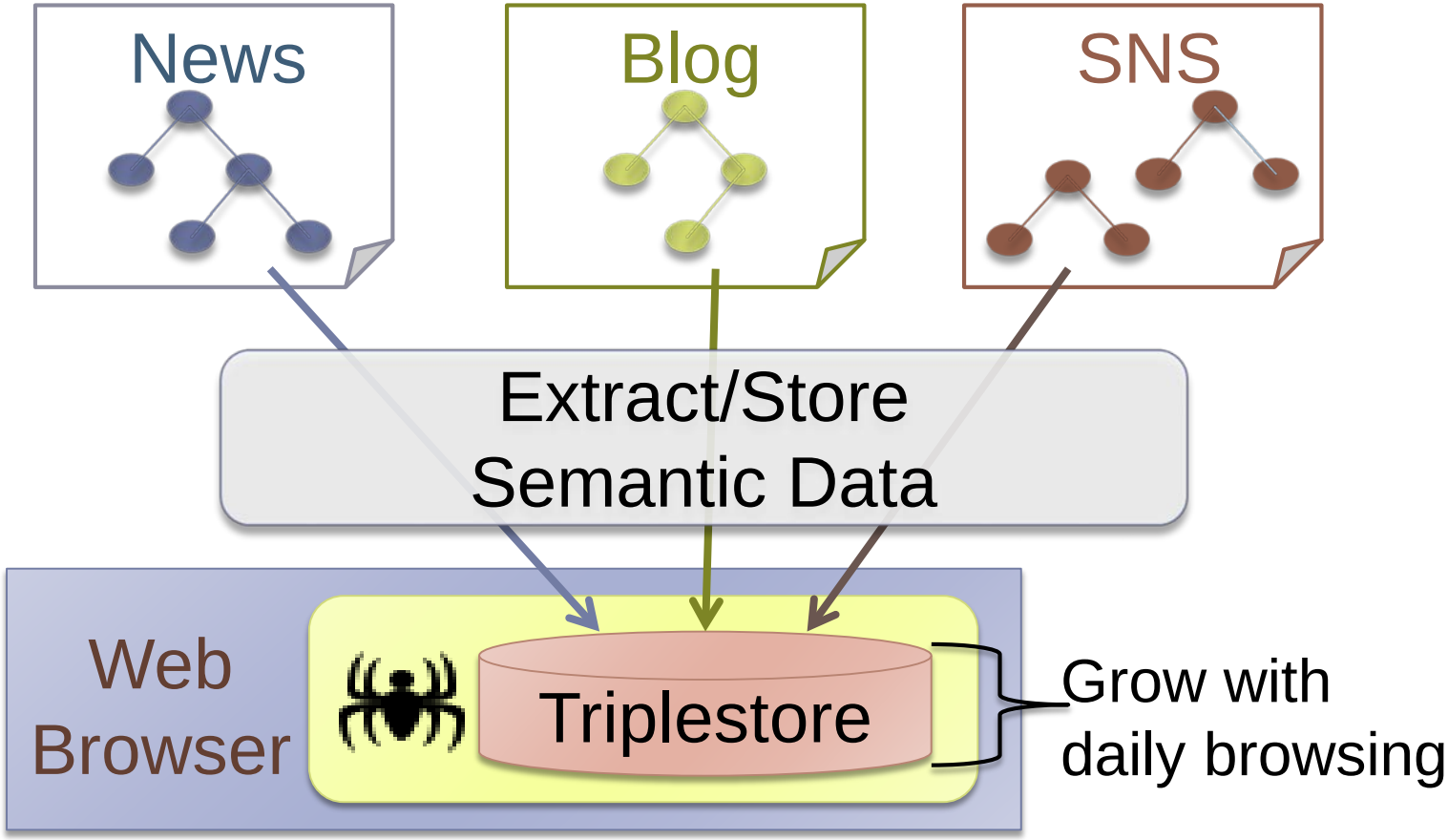
An Architecture of TriplestoreJS

- Extension on RDFa API supporting save/search/update/delete triples with Web Storage
- Open source on Github
  - https://github.com/shishimaru/triplestoreJS



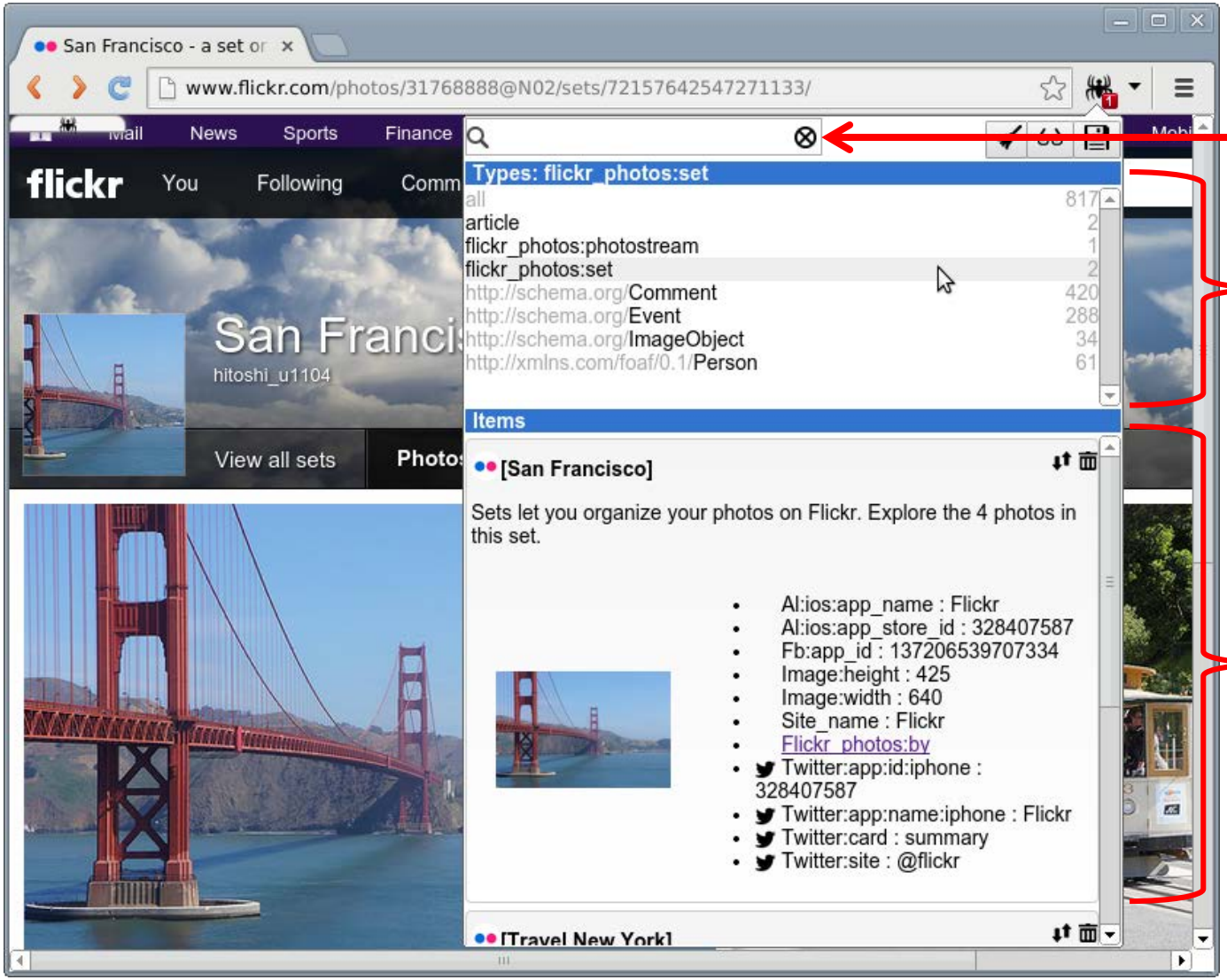
A User Knowledge Base on Web Browser

- Semantic Spider Plugin collects personal semantic data during web browsing
- Make a personal knowledge base in a web browser



UI for Viewing Personal Semantic Data

- A sample screenshot on online photo service Flickr



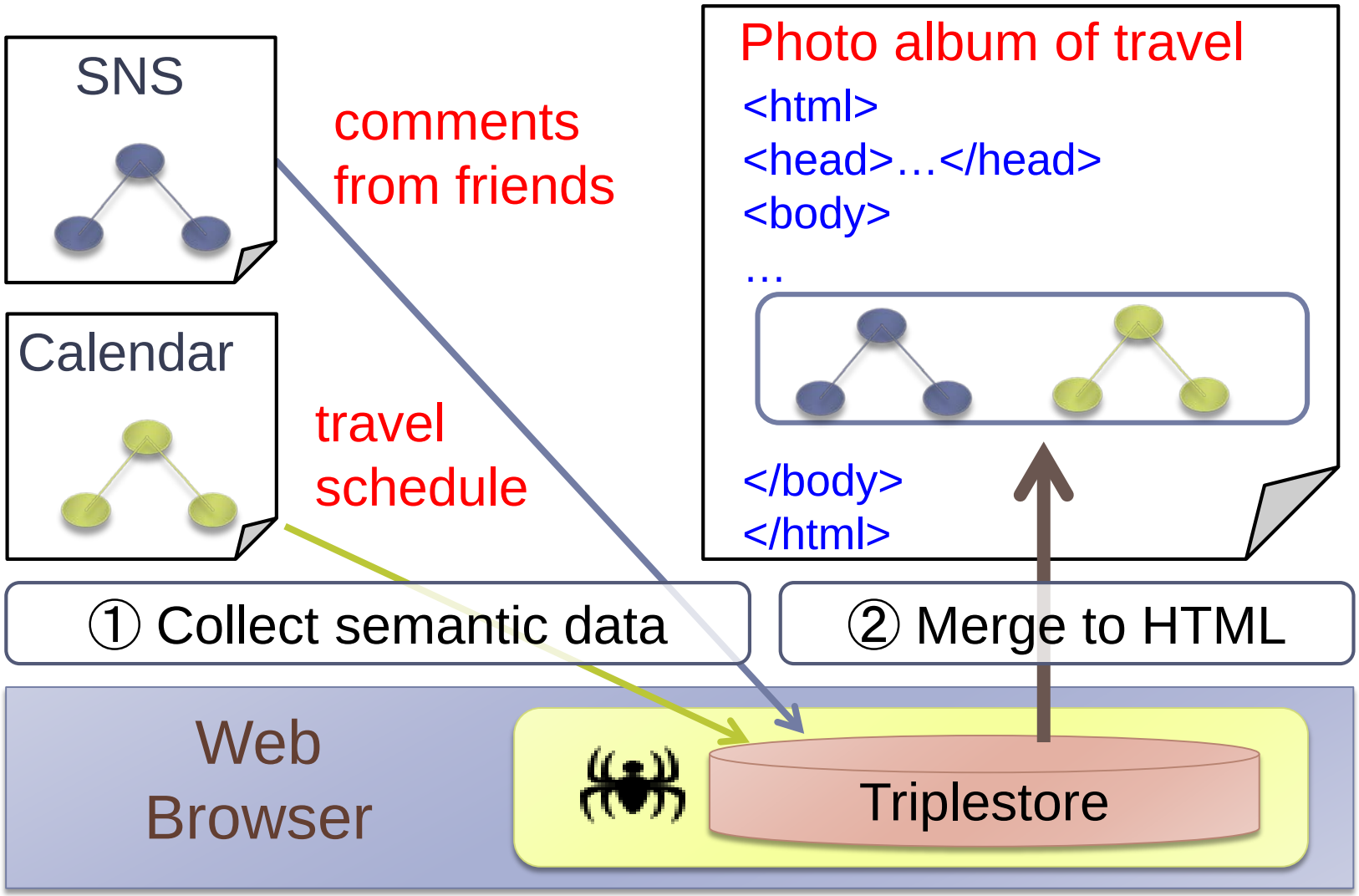
Text Search

Filter with Item type

Search Result

Challenge #1 : Suggesting Related Semantic Data

- Mash up related personal semantic data on any web sites users visit



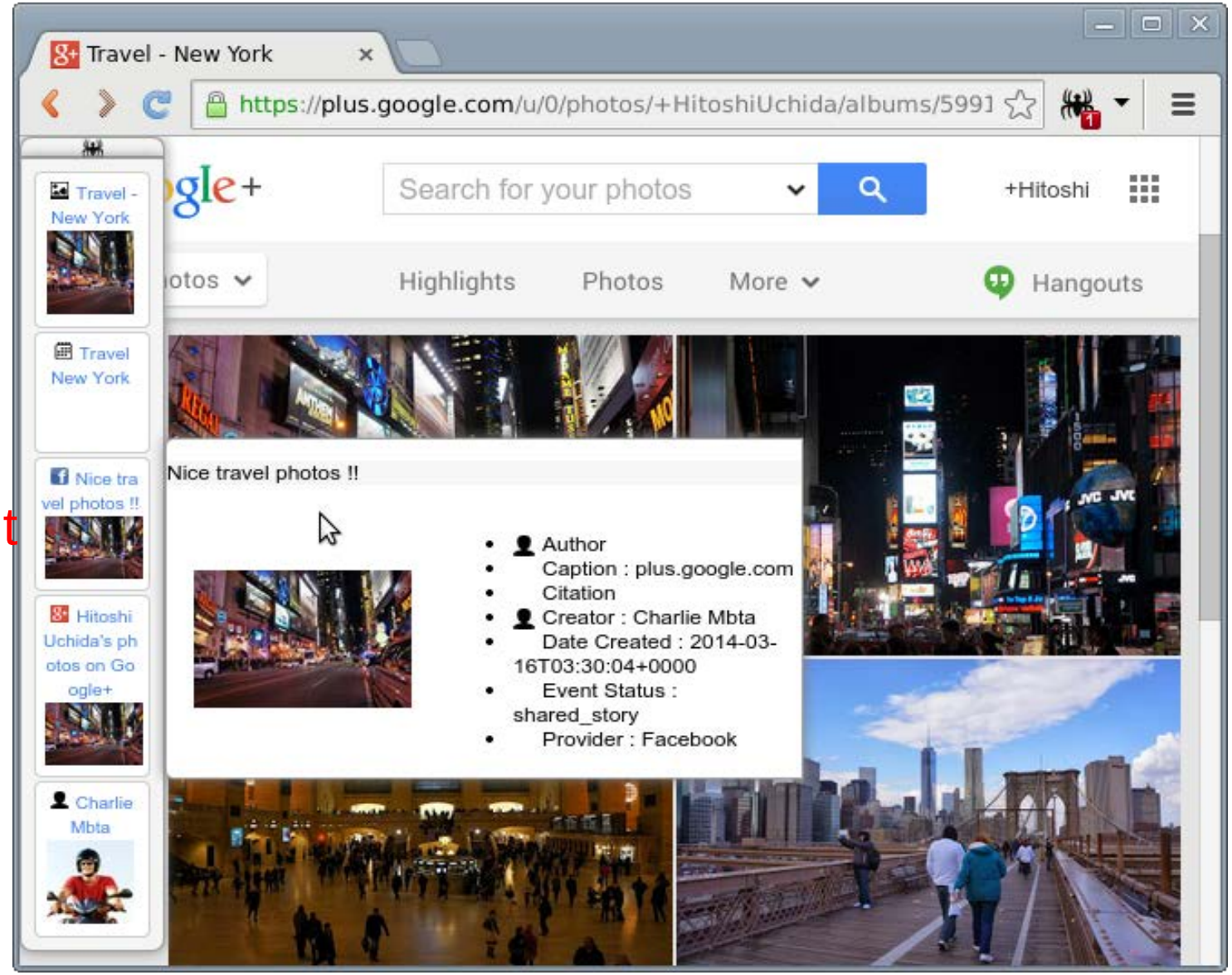
A Screenshot on Google+ Photo Album

Album item

Event Name

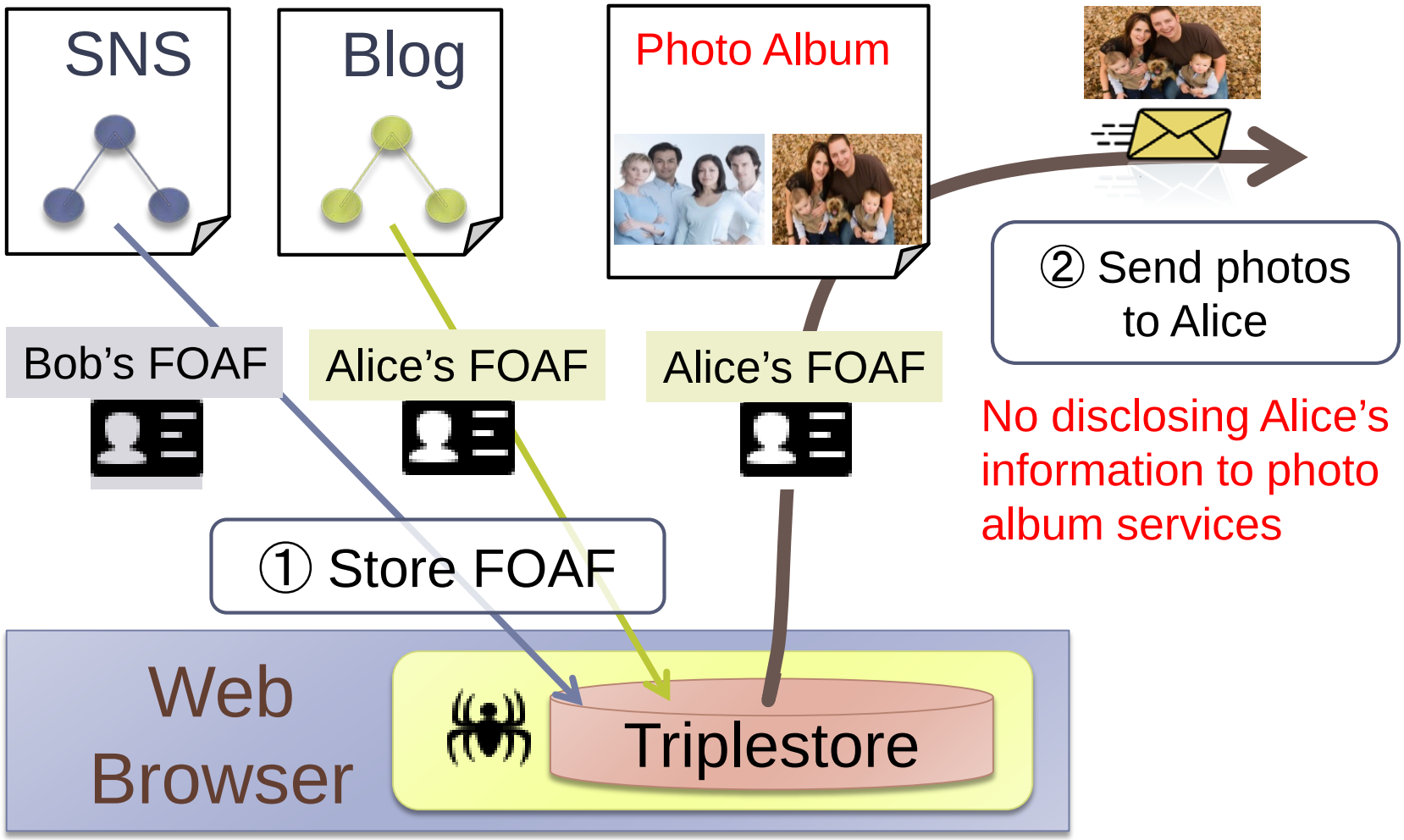
SNS comment

SNS friend who posted the comment



Challenge #2 : Assisting Media Sharing Operations

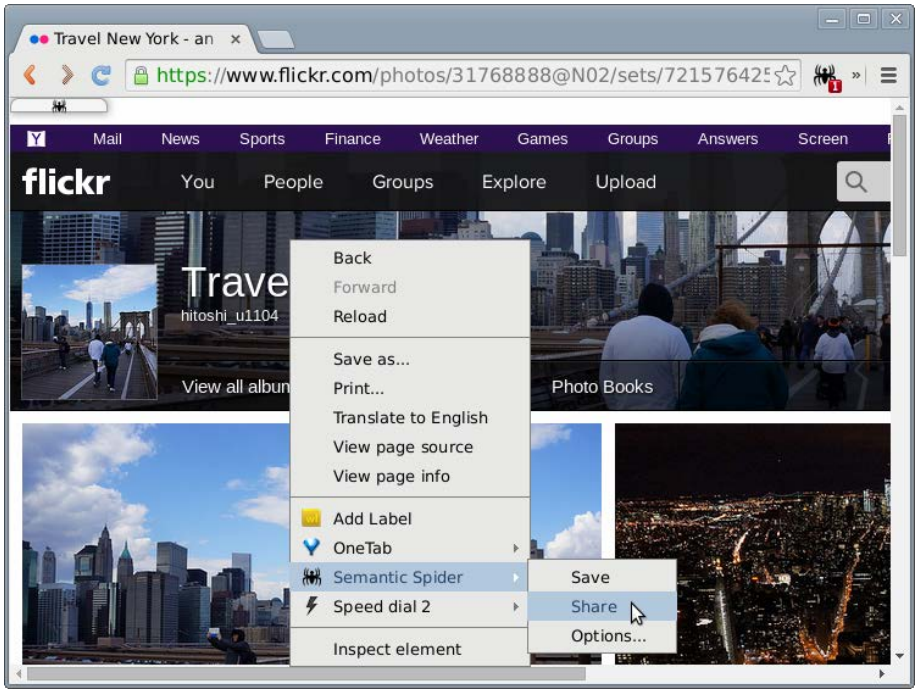
- Utilize stored FOAF for media sharing with friends via Google+, Facebook, Email

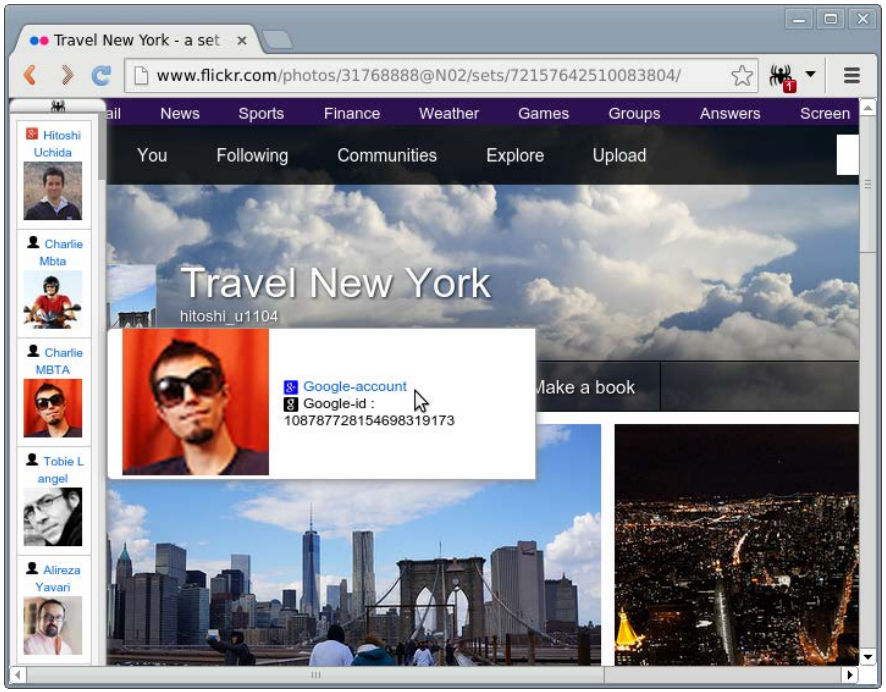


A Screenshot of Suggesting Contact Lists

① Right click a photo and select ‘Share’ menu

② Select a friend from suggested contact lists

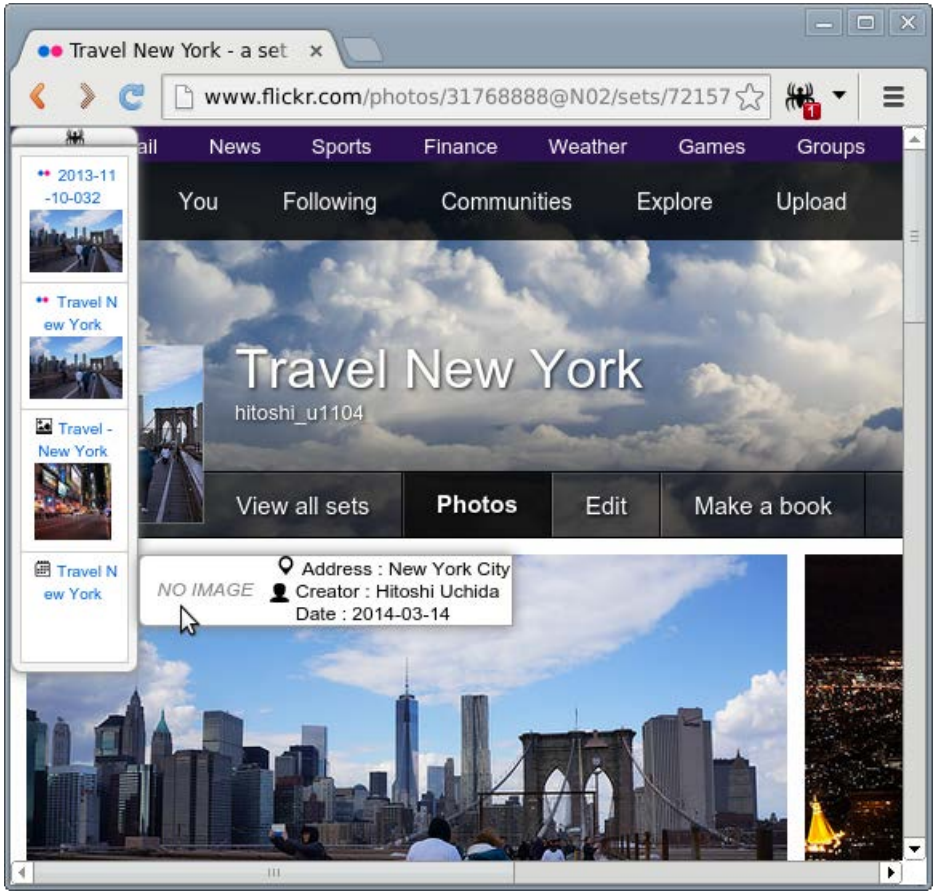


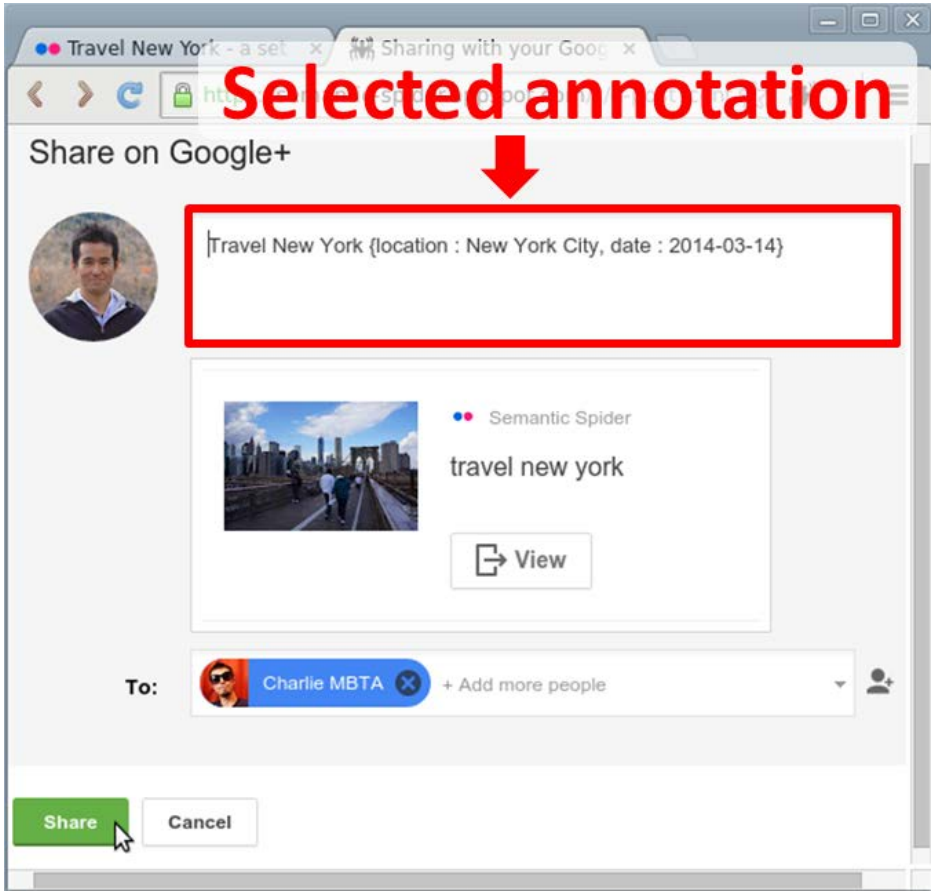


A Screenshot of Sharing an Annotated Photo

③ Select one of suggested items to annotate the photo

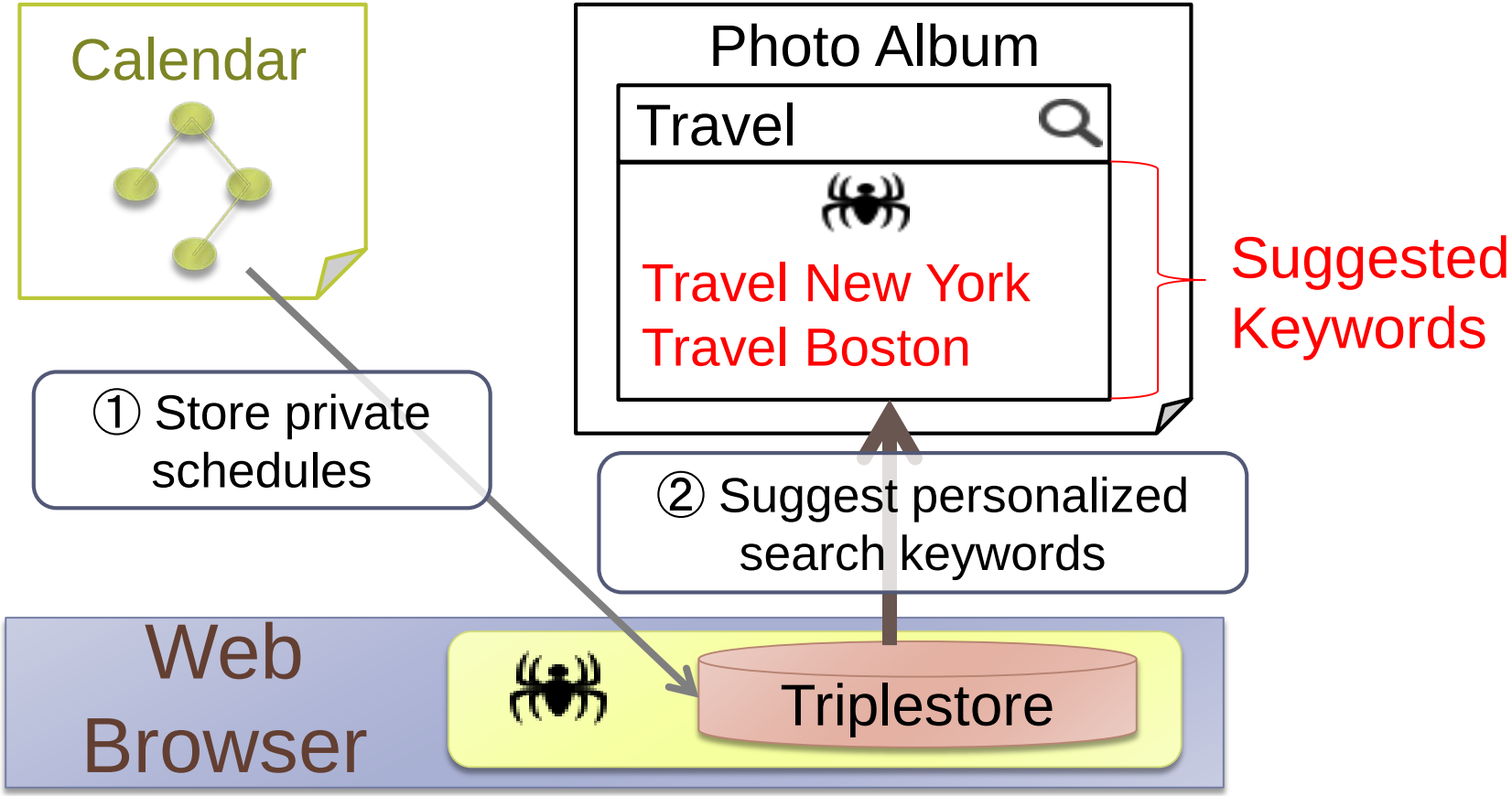
④ Share the photo with annotations via Google+



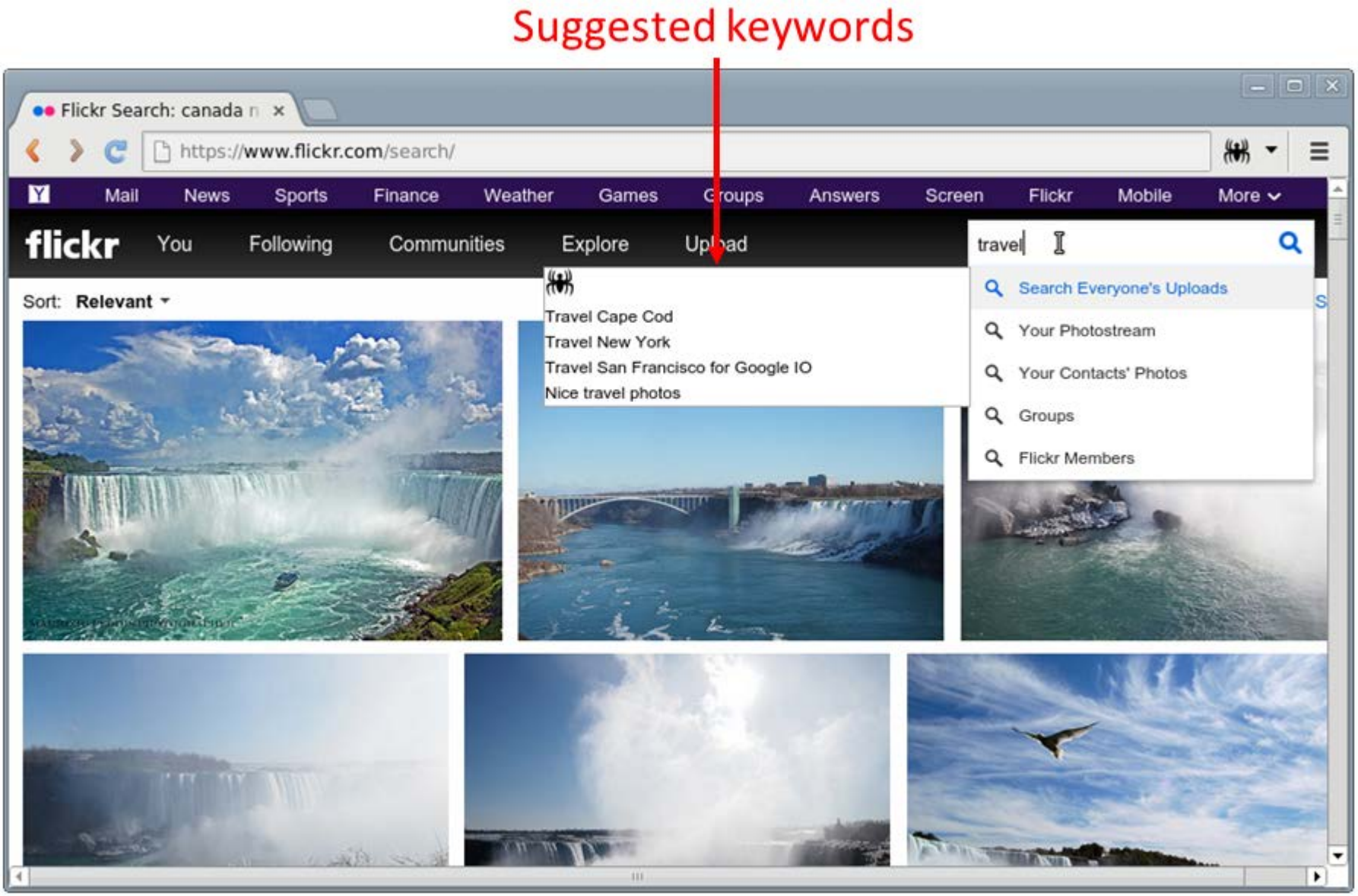


Challenge #3 : Assisting Text Input Operations

- Utilize personal semantic data to assist text input operations on web pages
- Support an optional filtering with a item type
  - <input type='text' itemtype='http://schema.org/Event'>

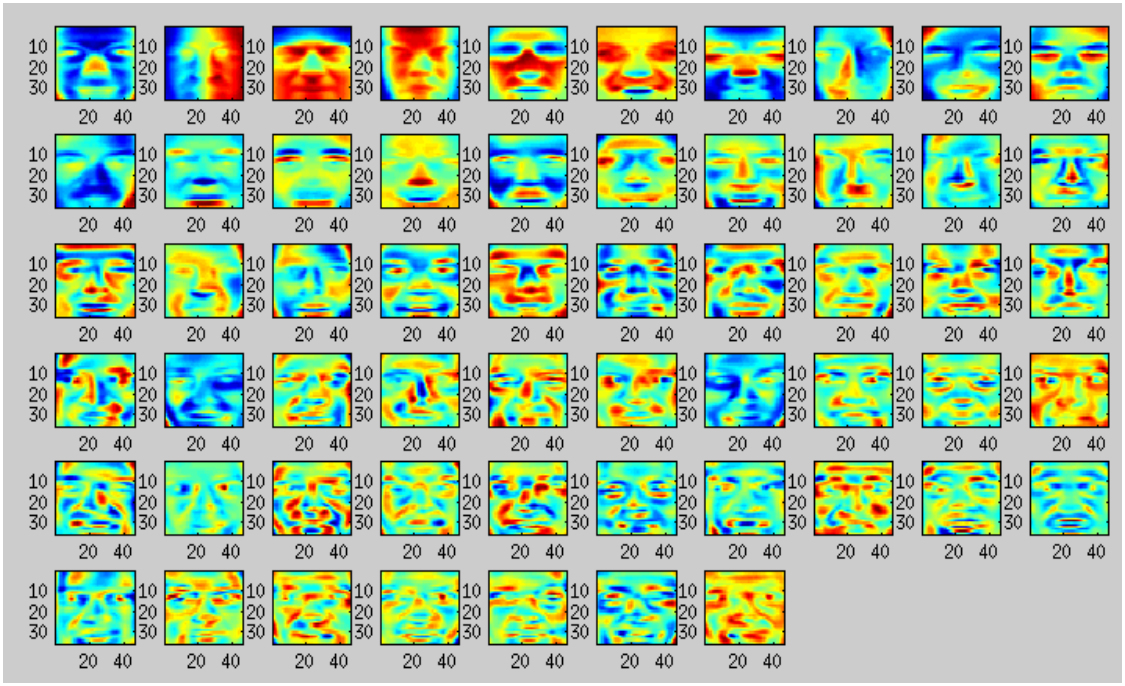


A Screenshot of Keyword Suggestion on Flickr



Challenge #4 : Annotating Online Photos with FOAF

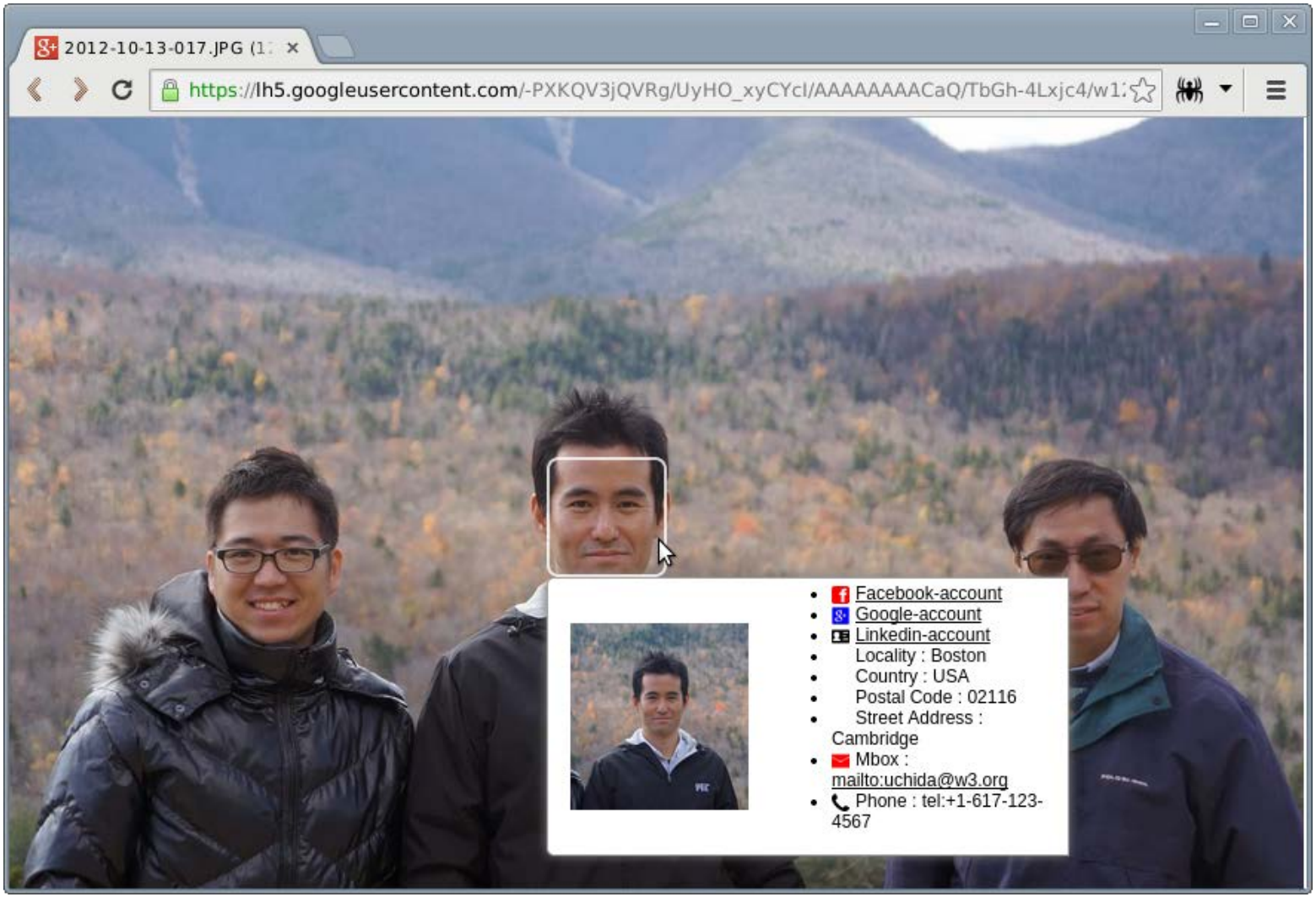
- Annotate faces of online photos with collected FOAF
  - No disclosing private information to album services
- Developed a face identification using FOAF image data
  - Integrated a training result with 13,233 face images as JS codes
  - Used ccv.js and face.js for face area detection



- Training result Eigenfaces
- Converted into JavaScript to integrate into Semantic Spider plugin

A Screenshot of Face Annotation with FOAF

- Overlay collected FOAF on Google+ online photos
  - Users can share the photo with clicking SNS accounts



Conclusion and Future Work

- Conclusion
  - Developed **TriplestoreJS** library for HTML5 web applications
  - Developed a web browser personalization plugin, **Semantic Spider**
    - Utilized personal semantic data collected during web browsing to personalize user experiences
- Future work
  - Replace underlying Web Storage with IndexedDB for better performance
    - TriplestoreJS can omit conversions from JS object to JSON string
    - Felt a risk using IndexedDB in W3C Candidate Recommendation when started development
    - Mobile platforms just started to support IndexedDB
- **We hope this work will inspire new applications of semantic web and be a promising bridge for HTML5 developers**

Thank you !

- Demo video
  - goo.gl/bvCeRN

- Hitoshi Uchida
  - Canon Inc.
  - W3C/MIT

plug.google.com/+HitoshiUchid

A Sample Code with TriplestoreJS

- Intuitive API for general HTML5 developers

```
var st = new Triplestore();
//Registers a pair of prefix and URI for CURIE processing
st.setMapping(‘foaf’, ‘http://xmlns.com/foaf/0.1’);

//Stores a triple of subject-property-value
st.add('http://example.org/people#bob', 'foaf:name', 'Bob');
st.add('http://example.org/people#bob', 'foaf:homepage', 'http://bob.org');

/* Searches properties. Returns
['http://xmlns.com/foaf/0.1/name', ’http://xmlns.com/foaf/0.1/homepage'] */
var properties = st.getProperties('http://example.org/people#bob');

//Searches a value. Returns [‘Bob’]
var name = st.getValues('http://example.org/people#bob', 'foaf:name');

//Searches all values. Returns [‘Bob’, ‘http://bob.org’]
var values = st.getValues('http://example.org/people#bob', null);
```

Performance Evaluation of TriplestoreJS

- Linear increase with the number of triples
  - Used semantic data from web pages, blog, Google+, Facebook